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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/010,429	12/03/2001	Teemu Sipila	324-010624-US (PAR)	7529
2512	7590	01/11/2007		
PERMAN & GREEN 425 POST ROAD FAIRFIELD, CT 06824			EXAMINER WONG, LINDA	
			ART UNIT	PAPER NUMBER
			2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/11/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/010,429

Applicant(s)

SIPILA, TEEMU

Examiner

Linda Wong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments, see Applicant's Remarks, filed 10/23/2006, with respect to the rejection(s) of claim(s) 1-32 under Channakeshu et al have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Hui et al (US Patent No.: 6674820) in view of Channakeshu et al (US Patent No.: 5371471).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hui et al (US Patent No.: 6674820) in view of Channakeshu et al (US Patent No.: 5371471).

a. **Claims 1,15,27,31,**

- Hui discloses

A. "determining a channel impulse response" (Fig. 4, label 415 and Col. 3, lines 50-58),

B. "selecting at least one of the highest and/or most reliable impulse response values" (Fig. 4, label 415, Col. 6, lines 6-12, 19-24,40-45, Hui discloses

selecting the set of channel impulse coefficients based on the candidate channel estimate whose associated squared-error is the smallest or the most reliable).

- Hui fails to disclose “sampling a received signal”, “determining a reference signal using the at least one impulse response value and a symbol sequence assumed as transmitted”, “determining differential terms corresponding to the selected impulse response values for a sample of the received signal and the reference signal”, “applying the determined differential terms to a symbol sequence transition metric for searching for the symbol sequence”, and “forming a survivor path by adding the symbol sequence provided by the transition metric to the survivor path formed so far”.
- Channakeshu et al discloses
  - A. “sampling a received signal” (Fig. 5, label 7),
  - B. “determining a reference signal using the at least one impulse response value and a symbol sequence assumed as transmitted” (Fig. 5, labels 13,11,rpre[n], Col. 16, lines 57-61),
  - C. “determining differential terms corresponding to the selected impulse response values for a sample of the received signal and the reference signal” (Fig. 5, labels 21,23, Col. 5, lines 25-54),
  - D. “applying the determined differential terms to a symbol sequence transition metric for searching for the symbol sequence” (Fig. 5, labels 21,23 and Col. 5, lines 25-54 and Col. 6, lines 2-18), and

- E. “forming a survivor path by adding the symbol sequence provided by the transition metric to the survivor path formed so far” (Fig. 2a,2b, Col. 6, lines 20-40, lines 49-68, Col. 7, lines 1-15).
- It would be obvious to one skilled in the art to incorporate the above components found within the equalizer as discloses by Channakeshu et al into Hui’s equalizer to provide a simplified equalizer and a low complexity MLSE equalization technique (Col. 3, lines 28-33).
- b. **Claims 2,16**, Chennakeshu et al discloses at least one reference signal is determined using the impulse response (Fig. 5, labels 11 and 13) and at least one later impulse response value (Fig. 5, label 21). Although Channakeshu et al fails to disclose “select impulse response”, Hui discloses such a limitation (Fig. 4, label 415, Col. 6, lines 6-12, 19-24,40-45).
- c. **Claims 3,17**, Chennakeshu et al discloses at least one reference signal is determined using only the impulse response value (Fig. 5, label 13 and Col. 11, lines 20-23). Although Channakeshu et al fails to disclose “select impulse response”, Hui discloses such a limitation (Fig. 4, label 415, Col. 6, lines 6-12, 19-24,40-45).
- d. **Claims 4,5,18,19**, Chennakeshu et al discloses computing differential terms or path metrics using the impulse response values  $h_0[n]$  and  $h_1[n]$  (Col. 5, line 35), which indicates the differential terms or path metrics is dependent on the number of impulse response values. Thus, the number of path metrics would increase or decrease depending on the number of impulse response values.

- e. **Claims 7,21**, Chennakeshu et al discloses using the trellis diagram and maximum likelihood sequence (Fig. 2a and Col. 6, lines 2-40)) to select the sequence of symbols or path based on the value or magnitude of the path metric. (Col. 6, lines 2-40 and lines 49-68 and Col. 7, lines 1-15)
  - f. **Claims 8,22**, Chennakeshu et al discloses selecting the maximum likelihood sequence depending on the path metric, which is calculated based on the channel impulse coefficients, thus the reliability of the channel impulse response is emphasized. (Col. 5, line 35, Col. 6, lines 2-40 and lines 49-68 and Col. 7, lines 1-15)
  - g. **Claims 9,23,29**, Chennakeshu et al discloses calculating the path metric using Euclidean distance squared (Col. 5, lines 29-30) between the received signal sample and the symbol sequence assumed as transmitted and convolved with the impulse response values (Col. 5, lines 35-43).
  - h. **Claims 11,25**, Chennakeshu et al discloses correlating the received signal sample and the symbol sequence assumed as transmitted and convoluted with the impulse response values. (Col. 5, lines 29-30)
  - i. **Claims 12,26**, Chennakeshu et al discloses adding the path metric to the survivor path formed. (Col. 49-64 and Fig. 2a and b)
3. **Claims 6,20,28,32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hui et al (US Patent No.: 6674820) in view of Channakeshu et al (US Patent No.: 5371471), and further in view of Kubo et al (US Publication No.: 20030081702).

- a. **Claims 6,20,28,32**, Although Chennakeshu et al and Hui et al does not disclose the number of path metrics or branch metrics or differential terms is based on the length of the channel memory, Kubo et al discloses the memory length for the Viterbi algorithm is based on the length of the channel. (paragraph 0025) It would be obvious to one skilled in the art to have the length of the memory based on the channel length to store the number of survivors, which depends on the length of the channel.
4. **Claims 10,24,30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hui et al (US Patent No.: 6674820) in view of Channakeshu et al (US Patent No.: 5371471) and further in view of Katsuragawa et al (US Patent No.: 5907586).
  - a. **Claims 10,24,30**, Katsuragawa et al discloses calculating the path metric in the Viterbi decoder using either the Euclidean or Hamming distance. (Col. 8, lines 44-55) It would be obvious to one skilled in the art to calculate the distance using the Hamming distance to produce appropriate distances so to determine the path or branch with the minimum cost so to determine the least costly path.
5. **Claims 13,14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hui et al (US Patent No.: 6674820) in view of Channakeshu et al (US Patent No.: 5371471).
  - a. **Claims 13 and 14**, it is inherently and obvious to one skilled in the art to use a computer, comprising components such as memory and software, to perform

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the method of finding the optimum path. It would be obvious to one skilled in the art to use a computer to compute the method to provide a quicker result and more efficient method of determining the optimum path.

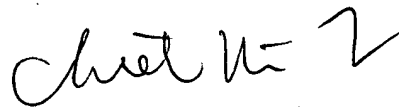
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Linda Wong



CHIEH M. FAN  
SUPERVISORY PATENT EXAMINER